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### ABSTRACT OF THE DISCLOSURE

The present invention relates to a composition for prevention and treatment of dandruff characterized by comprising zinc pyrithione and zinc salt. The composition of the present invention has excellent effects in prevention and treatment of dandruff

### SPECIFICATION

#### Title of the Invention

Composition for Prevention and Treatment of Dandruff

#### Field of the Invention and the Related Art

The present invention relates to a composition for prevention and treatment of dandruff. More particularly, it relates to a composition having excellent effects in prevention and treatment of dandruff through the improvement in an antibacterial activity against dandruff-causing bacteria by using zinc pyrithione and metal salt.

Component materials conventionally used in antidandruff agents have a limit of improvement in dandruff-preventing and dandruff-treating effects due to the dose limitation for the safety of human body. In addition, although the color of zinc pyrithione solution is milk-white, zinc pyrithione easily combines with ferrous ion contained in water or other components used for preparing the product to form ferrous pyrithione of dark blue, whereby the color of solution changes to dark blue, and, therefore, the appearance of the product is not good.

As part of a study to solve the problem, softening agents (i.e., chelating agents) were considered to be included in the zinc pyrithione solution. However, it is found that the agents capture zinc ions contained in zinc pyrithione, which

deteriorates the bactericidal activity against dandruff-causing bacteria and the stability of the product.

#### Technical Objects of the Invention

To solve the problems of the prior art, the present inventor has conducted a number of experiments and as a result, found that ferrous pyrithione is not formed if a zinc salt which has a high solubility in water is used, due to the common ion effect, which makes it possible to maintain the color of product to be fine, and the bactericidal activity against dandruff-causing bacteria can be remarkably improved by controlling the ratio of the zinc salt to zinc pyrithione. The present invention is based on this finding.

#### Constitutions and Effects of the Invention

The present invention relates to a dandruff-preventing and dandruff-treating composition characterized by comprising zinc pyrithione and zinc salt.

According to the present invention, there is provided a hair cosmetic composition having excellent effects in prevention and treatment of dandruff, where the effect of zinc pyrithione [trade name: Zinc Omadine (Oline)], i.e., the bactericidal activity against dandruff-causing bacteria, is enhanced by using zinc salt as a metal salt together with zinc pyrithione.

The zinc salt used in the dandruff-preventing and dandruff-treating composition of the present invention includes zinc chloride, zinc bromide, zinc iodide, zinc acetate and mixtures thereof. The ratio of zinc pyrithione/zinc salt is from 50/1 to 1/6, preferably from 10/1 to 1/4. If the ratio of zinc pyrithione/zinc salt is less than 50/1, the dandruff-preventing effect is poor, and if the ratio is more than 1/6, a further increase of the effect in proportion to the content is not observed, and, therefore, it is not economical.

The dandruff-preventing and dandruff-treating composition of the present invention can be useful for the hair cosmetic formulations such as hair shampoo, hair conditioner, etc.

The present invention is now further illustrated by, but is by no means limited to, the following Examples.

### Examples 1-7 and Comparative Example 1

As shown in Table 1, 30% sodium lauryl sulfate, 30% polyoxyethylene sodium lauryl sulfate, palm oil fatty acid diethanolamide, propylene glycol, zinc pyrithione and a zinc salt selected from zinc chloride, zinc bromide, zinc iodide and zinc acetate, were added to and mixed with water. The mixture was heated to 60 °C to form a solution and then cooled to 40 °C. After cooling, an appropriate amount of pigment (Blue 1), paraoxybenzoate ester, perfume and citric acid were added to the mixture and mixed together. The mixture was then cooled to the room temperature to form a shampoo type formulation.

Table 1

Material	(% by weight)							
	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Ex. 6	Ex. 7	Com. Ex. 1
Sodium lauryl sulfate (30%)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Polyoxyethylene Sodium lauryl sulfate (30%)	20.0	20.0	20.0	20.0	20.0	20.0	20.0	20.0
Palm oil fatty acid diethanol amide	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Propylene glycol	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Zinc pyrithione	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Zinc chloride	0.1	0.5	1.5	-	-	-	-	-
Zinc iodide	-	-	-	0.1	0.5	-	-	-
Zinc acetate	-	-	-	-	-	0.1	0.5	-
Pigment (Blue 1)	PQ	PQ	PQ	PQ	PQ	PQ	PQ	PQ
Paraoxybenzoate ester	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Perfume (synthetic perfume SKP-3473) *	PQ	PQ	PQ	PQ	PQ	PQ	PQ	PQ
Citric acid	PQ	PQ	PQ	PQ	PQ	PQ	PQ	PQ
Water	Balance of 100 % by weight							

Note: \*: Product of Hasegawa

PQ: proper quantity

The effects of the shampoo products prepared in Examples 1-7 and Comparative Example 1, on the prevention and treatment of dandruff were evaluated according to the following test.

#### Test on the Dandruff-preventing Effects (1)

For 40 people of both sexes having a scalp condition wherein a relatively large amount of dandruff is found, a sample of each of the hair shampoo product of Table 1 was applied for 1 month. The hair was washed with a conventional shampoo before the start of the test, and the dandruff accumulated for three days after shampooing was collected and weighed. The hair was then washed with the shampoo composition of Table 1 once every two days for one month and, thereafter, the dandruff accumulated for three days after the final shampooing during the test period was weighed.

The collection of the accumulated dandruff was carried out by cleaning the head portion with vacuum suction device, and the dandruff reduction percentage was calculated as follows:

Dandruff Reduction (%) =

$$\frac{\text{Amount of dandruff before test (mg)} - \text{Amount of dandruff 1 month after test (mg)}}{\text{Amount of dandruff before test (mg)}} \times 100$$

The test result is shown in Table 2.

Table 2

Sample	Average Reduction (%)	Effect on prevention of dandruff		
		Effective (No. of people)	Ineffective (No. of people)	Not certain (No. of people)
Example 1	50.2	4	1	-
Example 2	56.8	4	-	1
Example 3	52.2	5	-	-
Example 4	41.8	4	1	-
Example 5	50.3	4	-	1
Example 6	38.0	5	-	-
Example 7	52.8	4	-	1

Comparative Example 1	30.4	2	2	1
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#### Test on the Dandruff-preventing Effects (2)

5, 1, 0.5, 0.1, 0.05 and 0.01 % by weight of each of the shampoo compositions of Table 1 were added YM broth containing corn oil and *Pityrosporum orbiculare* was then inoculated in the amount of  $10^5$ - $10^6$  CFU (Colony Forming Unit)/ml. After incubating for 2 days, Minimal Inhibitory Concentration (MIC) and Minimal Bactericidal Concentration (MBC) were determined. The result is shown in Table 3.

Table 3

Sample	MIC (%)	MBC (%)
Example 1	0.01-0.05	0.05-0.1
Example 2	$\leq 0.01$	0.01-0.05
Example 3	$\leq 0.01$	0.01-0.05
Example 4	0.01-0.05	0.05-0.1
Example 5	$\leq 0.01$	0.01-0.05
Example 6	0.01-0.05	0.05-0.1
Example 7	$\leq 0.01$	0.01-0.05
Comparative Example 1	0.05-0.1	0.1-0.5

As shown in Tables 2 and 3, the shampoo compositions of Examples 1-7 containing a zinc salt according to the present invention, are superior to the shampoo composition of Comparative Example 1 in the dandruff preventing and reducing effects, and the effect on preventing and reducing dandruff increase in proportion to the content of zinc salt.

#### Examples 8-14 and Comparative Example 2

As shown in Table 4, cetyl alcohol, self-emulsifiable glycerol monostearate, paraoxybenzoate ester, 25% stearyl dimethylbenzyl ammonium chloride, propylene glycol, zinc pyrithione and a zinc salt selected from zinc chloride, zinc bromide, zinc iodide and zinc acetate, were mixed and heated to 75 °C. The mixture was then

added into purified water of 75°C and emulsified. The resultant was cooled to 40°C. After cooling, an appropriate amount of pigment, perfume and citric acid were added to the mixture and mixed together. The mixture was then cooled to the room temperature, and a hair conditioner composition was obtained.

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Table 4

Material	(% by weight)							
	Ex. 8	Ex. 9	Ex. 10	Ex. 11	Ex. 12	Ex. 13	Ex. 14	Com. Ex. 2
Cetyle alcohol	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Self-emulsifiable Glycerol monostearate	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Paraoxybenzoate ester	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Stearyl dimethyl benzyl ammonium chloride (25%)	8.0	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Propylene glycol	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0
Zinc pyrithione	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Zinc chloride	0.1	0.5	1.5	-	-	-	-	-
Zinc iodide	-	-	-	0.1	0.5	-	-	-
Zinc acetate	-	-	-	-	-	0.1	0.5	-
Pigment (Red 40)	PQ	PQ	PQ	PQ	PQ	PQ	PQ	PQ
Perfume (synthetic perfume SKP-3473) *	PQ	PQ	PQ	PQ	PQ	PQ	PQ	PQ
Citric acid	PQ	PQ	PQ	PQ	PQ	PQ	PQ	PQ
Water	Balance of 100 % by weight							

Note: \*: Product of Hasegawa

PQ: proper quantity

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The effects of the conditioner type products prepared in Examples 8-14 and Comparative Example 2, on dandruff and itchiness were evaluated according to the following test.

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#### Test on the Dandruff-preventing Effects (3)

For 40 people of both sexes having a scalp condition wherein a relatively large amount of dandruff is found, a sample of each of the hair conditioner products of Table 4 was applied for 1 month. The hair was washed with a conventional shampoo and rinsed with a conventional hair conditioner before the start of the test, and the dandruff accumulated for three days after shampooing was collected and weighed. The hair was then washed with the same conventional shampoo and rinsed with the hair conditioner composition of Table 4 once every two days for one month and, thereafter, the dandruff accumulated for three days after the final rinsing during the test period was weighed.

The collection of the accumulated dandruff was carried out in the same manner as in Example 1, and the results were evaluated as effective where the reduction percentage was 25% or greater.

Table 5

Sample	Average Reduction (%)	Effect on prevention of dandruff		
		Effective (No. of people)	Ineffective (No. of people)	Not certain (No. of people)
Example 8	48.5	4	-	1
Example 9	55.4	5	-	-
Example 10	58.4	5	-	-
Example 11	37.6	4	-	1
Example 12	55.7	5	-	-
Example 13	40.9	4	-	1
Example 14	52.4	5	-	-
Comparative Example 2	30.3	2	1	2

#### Test on the Dandruff-preventing Effects (4)

5, 1, 0.1, 0.05 and 0.01 % by weight of each of the hair conditioner compositions of Table 4 were added YM broth containing corn oil and *Pityrosporum orbiculare* was then inoculated in the amount of  $10^5$ - $10^6$  CFU (Colony Forming Unit)/ml. After incubating for 2 days, Minimal Inhibitory Concentration (MIC) and Minimal Bactericidal Concentration (MBC) were determined. The result is shown in Table 6.

Table 6

Sample	MIC (%)	MBC (%)
Example 8	0.01-0.05	0.05-0.1
Example 9	$\leq 0.01$	0.01-0.05
Example 10	$\leq 0.01$	0.01-0.05
Example 11	0.01-0.05	0.05-0.1
Example 12	$\leq 0.01$	0.01-0.05
Example 13	0.01-0.05	0.05-0.1
Example 14	$\leq 0.01$	0.01-0.05
Comparative Example 2	0.05-0.1	0.1-0.5

As shown in Tables 5 and 6, the hair conditioner compositions of Examples 8-14 containing a zinc salt according to the present invention, are superior to the hair conditioner composition of Comparative Example 2 in the dandruff preventing and reducing effects, and the effect on preventing and reducing dandruff increase in proportion to the content of zinc salt.



**What is claimed is:**

- 1. A composition for prevention and treatment of dandruff comprising zinc pyrithione and a zinc salt.**
  - 2. The composition of claim 1 wherein said zinc salt is zinc chloride, zinc bromide, zinc iodide, zinc acetate or the mixtures thereof.**
  - 3. The composition of claim 2 wherein the ratio of zinc pyrithione/zinc salt is from 50/1 to 1/6.**
  - 4. The composition of claim 3 wherein the ratio of zinc pyrithione/zinc salt is from 10/1 to 1/4.**
  - 5. The composition of any one of claims 1 to 4 wherein the composition for prevention and treatment of dandruff is a shampoo type formulation.**
  - 6. The composition of any one of claims 1 to 4 wherein the composition for prevention and treatment of dandruff is a hair conditioner type formulation.**
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